

## R marks

1. The Advisory Action (Paper No. 20) of 24 July 2003 maintained the prior art rejection based on Beal and Gupta (US 4,385,033). The amendments set out above are intended to place the claims in condition for allowance or in better condition for appeal. They raise no new issues and do not require additional examination. The amendments are based on the original disclosure at page 5, line 8. They clarify what was previously intended; they were not previously presented because until the Examiner interpreted the disclosure of Gupta '303 in the manner set out in Paper No. 20, it was not realized that any issue was taken about this point. Applicant did not apprehend the Examiner's contention first set out in Paper No. 20, that the present claims covered bypass tubes which passed reactant flow into successive catalyst beds rather than into successive portions of the same bed. This point is elucidated below.
2. In the remarks (third paragraph), the Examiner stated that Applicant's arguments with respect to the application of Gupta's teachings (open topped bypass tubes) to Beal's system (embedded bypass cages) had not been found to be persuasive because Gupta shows a system in which the bypass tubes enable the reactant flow to be successively passed from one catalyst bed to another (from 22a into 22b into 21). The Examiner referred to the catalyst beds as "portions" of "catalyst bed" and "said catalyst bed" and to a "bottom layer of said catalyst bed". This is, in fact, a mischaracterization both of the express terms of Gupta as well as of proper, technically versed interpretation. What Gupta (Figure 3) shows are not "portions" or "layers" of a single bed but, rather, separate beds. Gupta refers to them as such. See, for example, abstract, col. 2, lines 2, 3, 13, 14; col. 3, lines 27, 28, 30, 33, 45, 46, 67; column 4, lines 65-66 and in many other places. Thus, what Gupta is dealing with is not layers or parts of a single bed but rather, separate beds divided from one another by distributor trays and possibly other equipment (column 3, lines 42-44, referring to tray 15 which separates each of the beds in Figure 3).

3. It is submitted first, that the Examiner is not justified in applying Gupta's teachings in this way. But even if the Examiner were to take the view that it makes no difference what a volume of catalyst inside a reactor is called, whether it be a "bed" or a "portion" or "layer" of a bed, this too, would be wrong. It does make a difference. The Examiner might, for example, contend that if means are provided for bypassing plugged volumes of catalyst bed, it makes no difference whether the beds are arranged in successive and clearly separate beds or in non-discrete layers within a single, undivided bed. In the sense that the problem of catalyst fouling is overcome, this would be correct, just as catalyst fouling could be overcome by switching to a swing reactor but the problem is more intricate and subtle than this.
4. Obviously, if the height of the reactor is no problem, it would be possible to divide the catalyst volume into a number of individual separate beds each with its own distributor tray, rather as Gupta has shown in Figure 3 and the number might be multiplied as many times as the designer might wish to compensate for fouling. In real world, practical terms however, this is not always feasible: there are restrictions on reactor height: cost comes into the question; physical plant limitations enter into the equation, and reaction engineering is a consideration. An important factor is that with separate beds, additional height needs to be provided between each bed (by definition) but – and this is a matter of prime importance – a distributor tray needs to be provided in order to ensure uniform flow patterns through the beds: if flow is non-uniform, hot spots and exotherms may develop with an adverse effect on product quality and even catalyst or reactor damage. Inter-bed distributor trays are not an option. Another consideration is that each tray imposes its own pressure drop on gas flow and this requires compensation by higher inlet pressure up to the pressure limit of the reactor – but this may have an adverse effect on reaction equilibrium (e.g. if the reaction is one which has a net gas evolution) as well requiring increased compressor loads, imposing a financial penalty.
5. This means is that it is often uneconomic or simply infeasible to multiply the number of beds as Gupta has done and an alternative solution is required. Gupta '033 is a

dead end: it terminates bed life totally when bypassing is initiated. Gupta '033 provides no solution to the oft-repeated real life problem.

6. The present invention provides the solution: by embedding or burying the bypass cage inside the catalyst bed, it becomes possible to reduce the fouling problem without running into reactor height restrictions or the other problems outlined above. What the present invention does is, in effect, create a number of pseudo or virtual beds within a single catalyst bed and so, enables the advantages of a multiple bed system such as shown in Gupta '303 to be achieved within a limited height or, even, within an existing reactor. And if bypasses with tubes of varying length were to be provided or with divided cages, the number of pseudo-beds can be increased without penalty of height. This useful and economically attractive expedient could in no way have been predicated on the teachings in Gupta '303.
7. From this it follows that absent the creative insight of the present inventors, this technological advance would not have been achieved. Gupta '303 would not have suggested the desirability of using embedded cages and Beal would not have suggested the desirability of open-topped bypass tubes in combination with one another. There is nothing in Beal or Gupta which points towards the desirability of using these two separate expedients in combination. The only things which point towards the desirability of using embedded cages with open bypass tubes are first, the present application and second, the Examiner's hindsight reconstruction amply aided by the present application.
6. In the Office action of 15 August 2003, the Examiner noted that Gupta "clearly teaches that bypass apparatus without "moving or destructible component" (e.g. rupture disk) is an improvement over apparatus which contains said moving or destructible component". The disclosure of Gupta must certainly be conceded but it is applicable only to the device shown in Gupta, one with separate beds and bypass tubes passing wholly through the beds. There is no suggestion that Gupta's teaching would be applicable to a device such as that now claimed in which the cage is totally buried within the catalyst bed. As pointed out above, the use of

separate beds is an expedient which, while commendable, has limitations both technically and economically which the present invention is designed to overcome. The Gupta prior art teaching therefore does not provide a basis, even in the light of Beal, for the rejection of the present claims.

7. In view of the above, Applicant submits that the rejection based as it was upon Beal and Gupta was not warranted by the facts and should be withdrawn. Reconsideration is therefore requested.

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